M. Zimmerman 8HWM-ER
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 13 AM 9:08
U.S. EPA REGION VIII
SUPERFUND BRANCH

APR 7 1993

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EPA, REGION VIII
HAZARDOUS WASTE
MANAGEMENT DIVISION

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

MEMORANDUM

SUBJECT: Richardson Flat Tailings Site

FROM: Richard J. Guimond
Assistant Surgeon General, USPHS
Acting Assistant Administrator

TO: Robert L. Duprey, Director
Hazardous Waste Management Division
Region VIII

This is in response to your December 24, 1992, memorandum asking for clarification of my position on the Richardson Flat Tailings site. The site, in Summit County, Utah, was proposed to the National Priorities List in February 1992.

The attorney representing United Park City Mines (UPCM), the PRP, has indicated that I assured them EPA would not undertake a Remedial Investigation/Feasibility Study (RI/FS) or other studies at the site until EPA makes a decision on finalizing the site listing. As I understand it, the Region is currently performing some site work and would like to pursue other work which would not be consistent with such an assurance to the PRP.

I provided no such assurance in any of my dealings with UPCM. Notes recorded in the September 15, 1992, meeting with UPCM show that I did not reply to the request to hold off on performing the RI/FS or other studies. The question was asked once, to which I did not directly reply. The Region is free to proceed with site work; however, I would advise you to be cautious. UPCM's written comments on the proposed listing submitted during the comment period are substantial and a final decision on the site's NPL status has not yet been made by the Agency.

Please call Janet Grubbs at (703) 603-8860 if you have any further questions.

GEOPHYSICAL INVESTIGATION
OF MONITORING WELLS
RICHARDSON FLATS TAILINGS SITE
PARK CITY, SUMMIT COUNTY, UTAH
TDD #13-9211-001
PCS #6300-021-013-4006

PREPARED FOR:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region VIII
Waste Management Division
Mike Zimmerman, On-Scene Coordinator

PREPARED BY:

Samuel H. Baughman II
Geologist
Roy F. Weston, Inc.
Technical Assistance Team
Region III

December 9, 1992

TABLE OF CONTENTS

FIGURES

TABLE

APPENDICES

I. INTRODUCTION

On Wednesday, October 21, 1992, Patricia Hawkins, United States Environmental Protection Agency (EPA) Technical Assistance Team (TAT) Zone I Project Officer, requested that members of the Roy F. Weston, Inc., Region III TAT perform a geophysical investigation of three EPA-installed monitoring wells at the Richardson Flats Tailings Site. The written request by Patricia Hawkins for the zone cross over and investigation was dated November 2, 1992. The geophysical investigation was to provide independent verification and analysis of the installation of the three monitoring wells.

II. SITE BACKGROUND

The Richardson Flats Tailings Site is located approximately three to five miles northeast of Park City in Summit County, Utah. The site covers approximately 160 acres, of which there are more than 70 acres of mine tailings and approximately 20 acres of municipal landfill. The municipal landfill is bounded by Silver Creek to the west and a county road to the south (see Figure 1).

In June 1992, Region VIII TAT designed and installed three groundwater monitoring wells on the north, south, and east sides of the landfill to determine the possible presence and horizontal extent of any organic or inorganic contaminants in the soil beneath the landfill.

Subsequently, a disagreement occurred between United Park City Mines Company (UPCMC), the potentially responsible party (PRP), and the EPA regarding the locations and the designs of the three monitoring wells. Region III TAT was requested to provide independent verification of the installation procedures of the three (3) monitoring wells at this site. This request stipulated that natural gamma and gamma gamma density probes be utilized for the geophysical investigation.

III. ACTIONS TAKEN

BPB Instruments, Inc., was contracted by Region III TAT to conduct the geophysical investigation, which consisted of natural gamma and gamma gamma density probes. The natural gamma probe measures the naturally occurring potassium ions found in the soil. The gamma gamma density probe has a radioactive source that emits gamma particles, and the probe measures the particles that are reflected back from the soil or rock formation.

A neutron porosity probe was also utilized by BPB Instruments, Inc., in the investigation. This probe calculates the porosity of the soil by bombarding the formation with neutrons and measuring the quantity of neutrons reflected back to the detector.

On November 10 and 11, 1992, the geophysical investigation was conducted at the site by BPB Instruments, Inc., with EPA Region VIII and TAT Region III supervision. Representatives from UPCMC were also present during the investigation. TAT Region VIII was on site conducting water sampling of the wells prior to the geophysical investigation but was not part of Region III TAT's operation.

All data were recorded on computer disc, and hard copy graphs were produced in the field for preliminary analysis. A comparison of the geophysical logs, drill logs, and well design logs was made as part of this analysis.

IV. RESULTS

A. Well Locations

The three monitoring wells installed by TAT Region VIII are located around the eastern portion of the municipal landfill that is bisected by Interstate 40. Well RF-MW-01 is located to the south I-40 and is up gradient, while wells RF-MW-02 and RF-MW-03 are to the north of I-40 and are down gradient (See Figure 1).

B. Drilling Logs

These monitoring wells, RF-MW-01 with a diameter of six inches while RF-MW-02 and RF-MW-03 are four inches, were drilled with an air rotary drill rig, and interval sampling of the soil was done with a split spoon every five feet. This method of sampling does not reveal the maximum information about the subsurface conditions, as does continuous sampling, but is adequate when relatively thick units are encountered or when the subsurface conditions are known.

Two different soil horizons were encountered at each well location: one horizon of unconsolidated material and one of clay. The unconsolidated horizon may be subdivided into two sub-horizons: soil and soil with refuse. This upper unconsolidated horizon varies from 5 to 25.5 feet in thickness from the surface to the top of the clay layer (See Figure 2).

The unconsolidated sub-horizon of soil and refuse is more permeable than clay, thus allowing water to move, both horizontally and vertically, at a relatively fast rate. This horizon does not act as a confining layer for the clay below.

Drilling activities penetrated from 12 to 24 feet (Figure 2) into the clay horizon without piercing the bottom of the horizon; therefore, the thickness of the clay horizon is indeterminate.

This clay layer acts as an aquatard, that is it retards or greatly slows the movement of water through it. The net movement of water in an aquatard is down due to gravity. Relatively large amounts of water may be contained in an aquatard, possibly 40 to 60 percent by volume. This is because water takes such a long time to pass through clay. The hydraulic conductivity of clay, the rate at which water moves through clay, is approximately 0.001 feet per day (0.01 inches per day). In contrast, the hydraulic conductivity of the overburden, a silty clay, is approximately one foot per day.

Water within the clay layer will not move upward under hydraulic pressure. However, the clay horizon acts as a confining layer to aquifers below, increasing the hydraulic pressure of the lower aquifer. If the clay layer were to be completely penetrated to a lower aquifer, water from the lower aquifer would move upward through the well under pressure to produce artesian flow.

Groundwater levels measured within 24 hours after installation of the monitoring wells varied between 7.8 and 26.3 feet below the ground surface. These levels are below the top of the clay. When Region VIII TAT conducted water sampling during the geophysical investigation, measured water levels below ground surface were between 9.8 and 28.1 feet, approximately two feet lower than the levels at the time of well construction (See Table 1).

C. Well Design

Upon completion of drilling activities, monitoring wells were installed. Each well consisted of two-inch PVC casing and a screen with a bottom cap, a sand pack, a bentonite seal or plug, a bentonite and cement grout, and a well cap with lock. The screen has a slot size of 0.010 and the sand pack consists of 10 to 20 mesh Colorado Silica Sand. In RF-MW-01 and RF-MW-03 there are 15 feet of screen at the bottom and in RF-MW-02 there are only 10 feet. Sand packs were placed from the bottom of each well up to two to four feet above the top of the screen, in the annular space between the PVC casing and the side of the hole. The annular space is approximately one inch wide. Above the sand packs, a bentonite plug was placed. This plug measures two feet thick in RF-MW-01, 3.5 feet in RF-MW-02, and 2.5 feet in RF-MW-03 (See Table 1).

D. Geophysical Logging

Because interval sampling rather than continuous sampling was performed, it is difficult to be certain where various soil horizons begin and end vertically. For this reason, the geophysical data should be relied upon more than the drilling logs. It is possible to interprate the geohysical logs to within six inches vertically.

The geophysical logging more accurately confirmed the depth to the top of the clay horizon. It also helped to corroborate the placement of the sand packs and the bentonite plugs in each of the monitoring wells. In all of the wells, the bottom of the bentonite plug is at or below the top of the clay horizon. This placement will not permit water to migrate upwards or downwards through the sand pack into the horizon above (See Table 1).

In well RF-MW-02, the bottom of the bentonite plug is at the top of the clay layer as indicated by both the drill logs and the natural gamma log. However, the gamma gamma density and neutron porosity logs indicate that the bottom of the bentonite plug may be as deep as 27 or 29 feet below the ground surface. This would indicate that the bentonite plug is not above the clay horizon but actually below the top, thus inhibiting water in either direction-up or down.

V. CONCLUSIONS

Analysis of the drill logs indicates that a clay horizon of unknown thickness is overlain by an unconsolidated material. This overburden is relatively thin, approximately 5.5 feet thick, in RF-MW-01 and is composed of topsoil and silty clay. In RF-MW-02 and RF-MW-03, this overburden is somewhat thicker, 26 and 9 feet, respectively, and consists primarily of refuse from the landfill which is in turn covered by a thin cap layer, approximately one foot of topsoil.

All groundwater level readings demonstrate that groundwater does not rise above the top of the clay horizon, indicating no upward migration of water through the sand packs. If there were upward migration, the water would be stopped by the bentonite plug above the sand pack around the outside of the PVC casing, in any case. Water moving downward will also be stopped by the bentonite plugs in all of the monitoring wells. All screened areas are below the top of the clay horizon, therefore no cross contamination may occur through the screen.

The groundwater system is not isolated from the landfill because the groundwater must pass through the landfill as it moves downward. When the groundwater reaches the aquatard it begins to move more laterally downslope along the top of the clay surface. This aquatard is not totally impermeable, so water will migrate through it slowly. The rate of water movement will be greater laterally along the top of the clay layer than downward through it, however.

VI. SUMMARY

In view of all data - drill logs, well installation logs, and geophysical logs - the monitoring wells at this site have been installed and located in an acceptable manner according to EPA guidelines. Drilling within a landfill is not prohibited and has occurred at CERCLA sites involving municipal or solid waste landfills. Some examples of these sites are: Dorney Road Landfill, Hellertown Landfill, Picco Resin Landfill and Novak Landfill in Pennsylvania; Suffolk City Landfill in Virginia; Sussex County Landfill in Delaware; and Woodlawn Landfill in Maryland.

The RCRA Technical Groud-Water Monitoring Technical Enforcement Guidance Document, OSWER Directive 9950.1, recommends that a minimum of four monitoring wells be installed around a hazardous waste unit, one up gradient and three down gradient, for detection purposes. This publication does not prohibit the drilling in and through a landfill.

The publication Conducting Remedial Investigation/Feasibility Study of CERCLA Municipal Landfill Sites, EPA/540/P-91/011, OSWER Directive 9355.3-11, states that care should be taken for the placement and drilling of monitoring wells through a landfill. Drilling through the bottom of a landfill is not recommended, but is not prohibited; care must be taken to properly seal the hole so as to stop leachate from migrating to the lower aquifers.

A possible future action at this site may be to install a fourth well. If this is found necessary, then it is recommended that this well be placed between RF-MW-01 and RF-MW-02, with a screened area above the clay horizon to monitor water that will penetrate the landfill but not the clay. This water has the potential to discharge into Silver Creek and also into the swamp to the north.

As requested by the OSC, the recommended design of such a well should be a six inch hole, two inch I.D. schedule 40 PVC casing and approximately 10 feet of 0.010 screen with cap, approximately 20 mesh silica sand as a sand pack, and a bentonite plug of at least two feet thick above the sand pack. This design also allows for a larger annular space, approximately two inches, which allows the sand pack to filter sediments that the previous design may not have allowed for.

TABLE 1

Well Logging & Design*

Well (RF)	Top of Clay	Bentonite Plug Top	Bentonite Plug Bottom	Screening Depths	Bottom Depths
MW-1	5.0'	4.0'	6.0'	10.0-25.0'	25.0'
MW-2	25.5'	22.5'	26.0'	28.0-38.0'	39.0'
MW-3	10.0'	13.5'	16.0'	19.0-34.0'	35.0'

Well (RF)	Depths of Soil & Refuse
MW-1	---
MW-2	5.0-25.5'
MW-3	4.0- 9.0'

Geophysical Interpretation*

Well (RF)	Top of Clay	Bentonite Plug Top	Bentonite Plug Bottom	Top of Sand Pack
MW-1	5.5'	5.5'	10.0'	10.0'
MW-2	26.0'	23.0'	26.0'	26.0'
MW-3	9.0'	13.5'	16.0'	16.0'

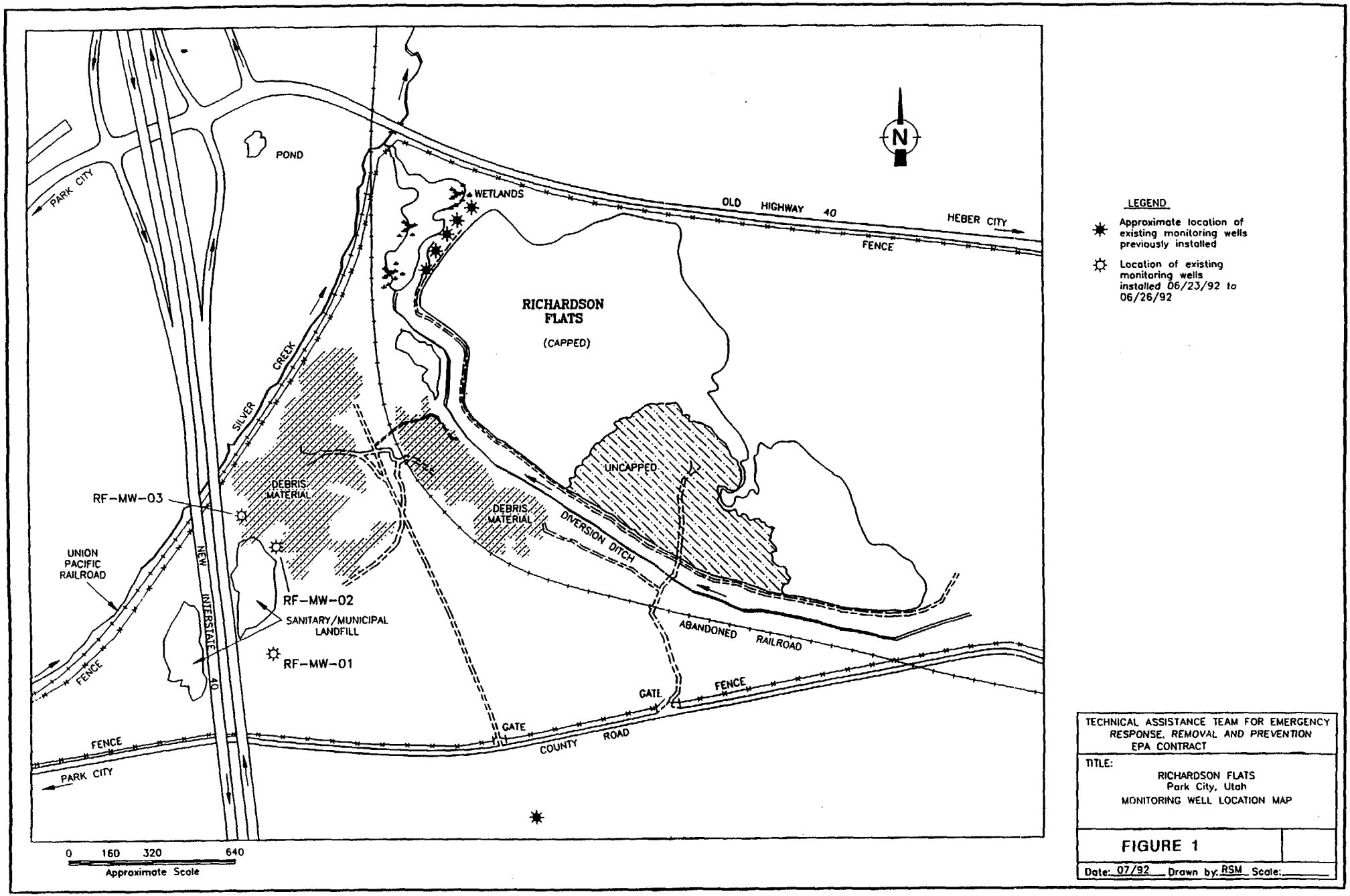
Groundwater Level Readings*

Well (RF)	6/92	11/10/92	1/11/92 **
MW-1	7.8'	9.84'	8.0'
MW-2	26.3'	28.13'	28.0'
MW-3	21.3'	22.26'	23.0'

Notes: * All measurements from surface to depth.
**Measured with gamma probe 24 hours after wells were purged for sampling.

Source of data used for Table 1 is as follows:

Well Logging & Design	Geophysical Interpretation
Soil & Refuse	Top of Clay Horizon
Screening Depths	Bentonite Plug
Groundwater Level Readings	Sand Pack



LEGEND

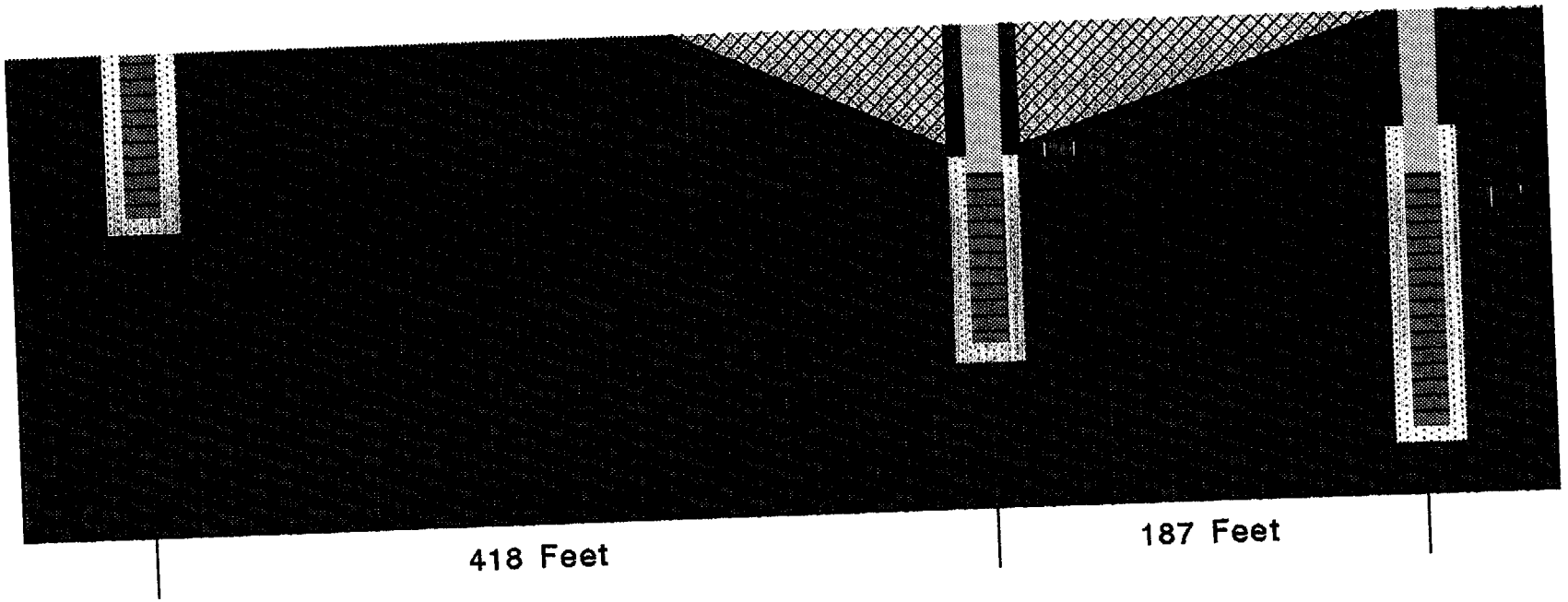
- Approximate location of existing monitoring wells previously installed
- Location of existing monitoring wells *installed 06/23/92 to 06/26/92*

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT

TITLE:
RICHARDSON FLATS
Park City, Utah
MONITORING WELL LOCATION MAP

FIGURE 1

Date: 07/92 Drawn by: RSM Scale:



LEGEND

OVERBURDEN

MUNICIPAL LANDFILL REFUSE & SOIL

RED-BROWN CLAY

GROUT

BENTONITE PLUG

SAND PACK

GROUNDWATER LEVEL (11/10/92)

PVC WELL WITH SCREEN

Scale
Vertical: 1" = 10'
Horizontal: Not to Scale

Data from Table 1

FIGURE 2
GEOLOGIC CROSS SECTION

TABLE 1

Well Logging & Design*

Well (RF)	Top of Clay	Bentonite Plug Top	Bentonite Plug Bottom	Screening Depths	Bottom Depths
MW-1	5.0'	4.0'	6.0'	10.0-25.0'	25.0'
MW-2	25.5'	22.5'	26.0'	28.0-38.0'	39.0'
MW-3	10.0'	13.5'	16.0'	19.0-34.0'	35.0'

Well (RF)	Depths of Soil & Refuse
MW-1	---
MW-2	5.0-25.5'
MW-3	4.0- 9.0'

Geophysical Interpretation*

Well (RF)	Top of Clay	Bentonite Plug Top	Bentonite Plug Bottom	Top of Sand Pack
MW-1	5.5'	5.5'	10.0'	10.0'
MW-2	26.0'	23.0'	26.0'	26.0'
MW-3	9.0'	13.5'	16.0'	16.0'

Groundwater Level Readings*

Well (RF)	6/92	11/10/92	1/11/92 **
MW-1	7.8'	9.84'	8.0'
MW-2	26.3'	28.13'	28.0'
MW-3	21.3'	22.26'	23.0'

Notes: * All measurements from surface to depth.
**Measured with gamma probe 24 hours after wells were purged for sampling.

Source of data used for Table 1 is as follows:

Well Logging & Design	Geophysical Interpretation
Soil & Refuse	Top of Clay Horizon
Screening Depths	Bentonite Plug
Groundwater Level Readings	Sand Pack

APPENDIX A

DRILL LOG

PROJECT RICHARDSON FLATS TAILINGS SITE JOB NO. T08-9204-15 DATE 6/23-25/92

WELL/BORING RF-MW-01 LOCATION PARK CITY, SUMMIT LOGGER T. SANDERS

DRILL METHOD AIR ROTARY/CASING DRIVE COUNTY, UTAH PAGE 1 OF 1

WATER LEVEL FIRST ENCOUNTERED N/A FINAL 7.8 FT. ELEV. N/A

DEPTH IN FEET	LITH COL	SAMPLE TYPE IDENT.	MOISTURE CONTENT WATER LEVEL	LITHOLOGIC DESCRIPTION	NOTES
			DRY	Top Soil - Silty to clayey, dark brown, plant roots Cuttings 3-5 ft. depth: quartzitic and volcanic fragments	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 4/13/19/30 SAMPLE RECOVERY: 50%
5			DRY MOIST	Silty-Clay - med. brown, 2-10mm sub-angular quartzitic and volcanic fragments, micaceous, pyrite (oxidized), sl. mottled Cuttings 8.5 ft. depth: clay med brown Cuttings 9-11 ft.depth: sand	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 6/8/13/14 SAMPLE RECOVERY: 50% Water @ 7.8 ft.
10			MOIST	Clay - dark reddish/brown with 3-10mm silicic breccia fragments, micaceous, limonitic staining	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 16/33/21/28 SAMPLE RECOVERY: 65%
15			MOIST WET	Clay - brown to reddish /brown, micaceous, 2-15mm silicic fragments	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 8/10/18/42 SAMPLE RECOVERY: 65%
20			WET	Clay - dark red/brown, approx. 30% coarse grained to gravel-sized sub-angular rock fragments, no bedding evident	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 17/20/45/50 SAMPLE RECOVERY: 50% TOTAL DEPTH 25.0 ft.

DRILL LOG

PROJECT RICHARDSON FLATS TAILINGS SITE JOB NO. T08-9204-15 DATE 6/24-26/92

WELL/BORING RF-MW-02 LOCATION PARK CITY, SUMMIT LOGGER T. SANDERS

DRILL METHOD AIR ROTARY/CASING DRIVE COUNTY, UTAH PAGE 1 OF 2

WATER LEVEL FIRST ENCOUNTERED N/A FINAL 26.3 FT. ELEV. N/A

DEPTH IN FEET	LITH COL	SAMPLE TYPE IDENT.	MOISTURE CONTENT WATER LEVEL	LITHOLOGIC DESCRIPTION	NOTES
			DRY	Overburden - silt and gravels, dark brown soil, silicic rock fragments	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 19/50/Refusal SAMPLE RECOVERY: 25%
5			DRY	Top Soil/Refuse - dark brown silty soil, wood chips and rock fragments 2-6mm, aromatic Cuttings 5-10 ft. depth: wood, paper pulp, etc.	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 13/20/27/9 SAMPLE RECOVERY: 5%
10			SL. MOIST	Clay/Refuse - dark brown clay, silicic pebbles, plastic,glass, wood chips	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 7/6/9/10 SAMPLE RECOVERY: 65%
15			DRY	Refuse - black fiberous material, plastic, paper, charcoal	HNU: 0.5 ppm above bkgd. BLOW COUNTS: 13/23/21/11 SAMPLE RECOVERY: 20%
20			---	Refuse - wood plug blackened by fire, large silicic rock clast	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 19/22/7/7 SAMPLE RECOVERY: 5%

DRILL LOG CONTINUED

DRILL LOG

PROJECT RICHARDSON FLATS TAILINGS SITE JOB NO. T08-9204-15 DATE 6/24-26/92

WELL/BORING RF-MW-02 (continued) LOCATION PARK CITY, SUMMIT LOGGER T. SANDERS

DRILL METHOD AIR ROTARY/CASING DRIVE COUNTY, UTAH PAGE 2 OF 2

WATER LEVEL FIRST ENCOUNTERED N/A FINAL 26.3 FT. ELEV. N/A

DEPTH IN FEET	LITH COL	SAMPLE TYPE IDENT.	MOISTURE CONTENT WATER LEVEL	LITHOLOGIC DESCRIPTION	NOTES
25			MOIST ▼	Silty-Clay - black, pebbles, wood, plastic, paper, grading into a reddish/brown clay, 2-6mm pebbles	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 5/6/5/8 SAMPLE RECOVERY: 60% Water @ 26.3 ft.
30			VERY MOIST	Clay - reddish/brown, highly plastic, 2-17mm silicic fragments	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 3/3/8/26 SAMPLE RECOVERY: 85%
35			WET	Clay - red/brown, 10-20mm fragments, grading to dark reddish/brown clay containing lenses of gray quartzite	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 25/18/19/44 SAMPLE RECOVERY: 65% TOTAL DEPTH 39.0 ft.

DRILL LOG

PROJECT RICHARDSON FLATS TAILINGS SITE JOB NO. T08-9204-15 DATE 6/26/92

WELL/BORING RF-MW-03 LOCATION PARK CITY, SUMMIT LOGGER T. SANDERS

DRILL METHOD AIR ROTARY/CASING DRIVE COUNTY, UTAH PAGE 1 OF 2

WATER LEVEL FIRST ENCOUNTERED N/A FINAL 21.3 FT. ELEV. N/A

DEPTH IN FEET	LITH COL	SAMPLE TYPE IDENT.	MOISTURE CONTENT WATER LEVEL	LITHOLOGIC DESCRIPTION	NOTES
			DRY	Top Soil - silty, lt. brown soil, 20-30mm silicic fragments	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 8/34/29/16 SAMPLE RECOVERY: 15%
				Cuttings 4 ft. depth: black charred wood chips	
5			DRY	Refuse - charred wood/charcoal, 20-30mm quartzite clast Cuttings 5-6 ft. depth: black/brown sl. plastic clay Cuttings 9 ft. depth: reddish/brown sl. plastic clay	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 3/4/12/13 SAMPLE RECOVERY: 10%
10			---	Clay - pebbles and 2 inch layer silicic fragments, limonitic stained silty clay v. sl. plastic charcoal in core Cuttings 12 ft. depth: lt. brown clay, silicic clasts	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 3/4/4/11 SAMPLE RECOVERY: 15%
			MOIST	Cuttings 14 ft. depth: med. brown clay	
15			MOIST	Clay - dark brown sl. plastic clay silicic fragments, grading to multi-colored clay with pebbles, to reddish/brown clay highly plastic	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 27/28/11/8 SAMPLE RECOVERY: 65%
20			MOIST ▼ WET	Clay - brown/reddish brown, plastic, sl. mottled, 1-2 mm clasts silicic material and micaceous	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 7/5/5/7 SAMPLE RECOVERY: 90% Water @ 21.3 ft.
					DRILL LOG CONTINUED

DRILL LOG

PROJECT RICHARDSON FLATS TAILINGS SITE JOB NO. T08-9204-15 DATE 6/26/92

WELL/BORING RF-MW-03 (continued) LOCATION PARK CITY, SUMMIT LOGGER T. SANDERS

DRILL METHOD AIR ROTARY/CASING DRIVE COUNTY, UTAH PAGE 2 OF 2

WATER LEVEL FIRST ENCOUNTERED N/A FINAL 26.3 FT. ELEV. N/A

DEPTH IN FEET	LITH COL	SAMPLE TYPE IDENT.	MOISTURE CONTENT WATER LEVEL	LITHOLOGIC DESCRIPTION	NOTES
25			WET	Clay - dark brown to reddish/ brown, plastic, grading to reddish/ brown sl. palstic clay, subangular silicic clasts, micaceous	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 8/16/42/19 SAMPLE RECOVERY: 25%
30			WET	Clay - reddish/brown, plastic, grading to 1 ft. thick coherent clay interval, into red/brown clay containing pebbles	HNU: 0.0 ppm above bkgd. BLOW COUNTS: 2/5/12/13 SAMPLE RECOVERY: 85%
					TOTAL DEPTH 35.0 ft.

APPENDIX B

WELL/PIEZOMETER COMPLETION DIAGRAM

Project RICHARDSON FLATS TAILINGS SITE

TDD No. T08-9204-15

Location PARK CITY, SUMMIT COUNTY, UTAH

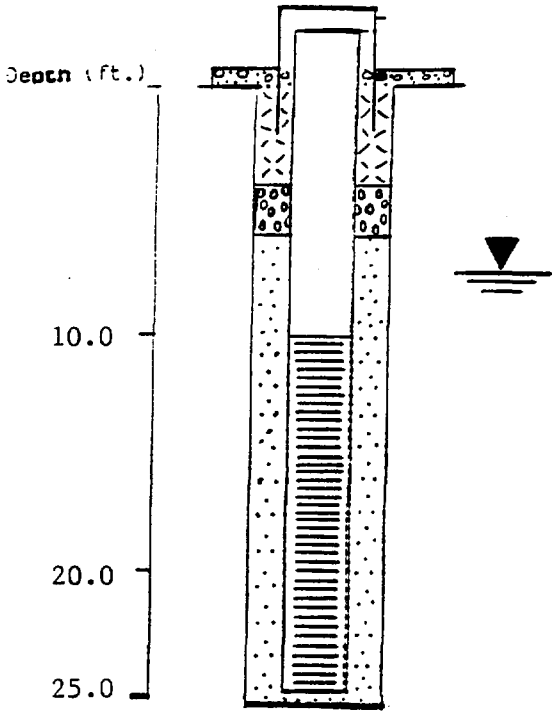
Well Number RF-MW-01

Geologist T. SANDERS

Date(s) of Installation 6/23-24/92

Depth to water 7.8 feet (G.L.)

Elevation from Measuring Point GROUND SAUFACE



DRILLING SUMMARY:

Driller BOYLES BROTHERS DRILLING CO.

Rig Type B-53
Drilling Method AIR ROTARY/CASING DRIVE
Bit(s) HAMMER (ODEX)/TRI-CONE BITS
Drilling Fluid ---

Surface Casing ---
Hollow Stem/Drive Casing I.D. (in.) 4"
Total Depth of Boring (ft.) 25
Borehole Diameter (in.) 4

WELL DESIGN:

Completion Basis: Above Grade X Geological Log X
Below Grade ____ Geophysical Log ____ Type ____

Total Depth of Well (ft.) 25
Casing String(s): C=casing S=screen

+2.5	-	10.0	C		-
10.0	-	25.0	S		-

Casing: SCHEDULE 80 PVC, 2" I.D. THREADED WITH FLUSH THREADS
Screen: SCHEDULE 80 PVC, 2" I.D., 0.010" SLOT SIZE WITH BOTTOM CAP
Centralizers ---
Gravel/Sand Pack 6.0 to 25.0 feet
10-20 MESH COLORADO SILICA SAND
Bentonite Seal(s) 4.0 to 6.0 feet
to feet
Bentonite (type) PELLETS ¼"
Backfill (cuttings) --- to feet
Cement Seal(s) 0.0 to 4.0 feet
to feet
Cement Composition 90% PORTLAND TYPE I-II LOW ALKALI CEMENT 10% BENTONITE
Protective Casing 2.25 to +2.75 feet
Protective Casing Type 5" NOMINAL DIAMETER STEEL CASING
Other ---

WELL DEVELOPMENT:

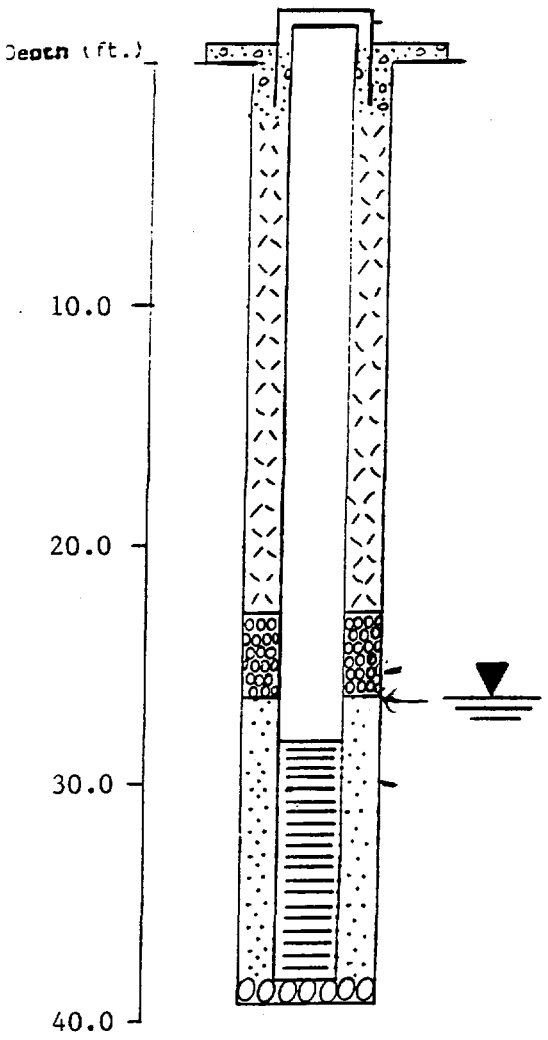
Method BAILING - 2½ FT. STAINLESS STEEL BAILER

Duration 1.0 hrs Estimated production L.T. 1 gpm
Water Appearance LIGHT TAN, SL. TURBID

Remarks: TOTAL DISCHARGE = 12.0 GALLONS

WELL/PIEZOMETER COMPLETION DIAGRAM

Project RICHARDSON FLATS TAILINGS SITE
TDD No. T08-9204-15
Location PARK CITY, SUMMIT COUNTY, UTAH
Well Number RF-MW-02
Geologist T. SANDERS
Date(s) of Installation 6/24-26/92
Depth to water 26.3 feet (G.L.)
Elevation from Measuring Point GROUND SURFACE



DRILLING SUMMARY:

Driller BOYLES BROTHERS DRILLING CO.

Rig Type B-53
Drilling Method AIR ROTARY/CASING DRIVE
Bit(s) HAMMER (ODEX)/TRI-CONE BITS
Drilling Fluid ---

Surface Casing ---
Hollow Stem/Drive Casing I.D. (in.) 4
Total Depth of Boring (ft.) 39
Borehole Diameter (in.) 4

WELL DESIGN:

Completion Basis: Above Grade X; Geological Log X; Below Grade ___; Geophysical Log Type ___

Total Depth of Well (ft.) 38
Casing String(s): C=casing S=screen
+1.5 - 28.0 C
28.0 - 38.0 S

Casing: SCHEDULE 80 PVC, 2" I.D. THREADED WITH FLUSH THREADS
Screen: SCHEDULE 80 PVC, 2" I.D., 0.010 SLOT SIZE WITH BOTTOM CAP
Centralizers ---
Gravel/Sand Pack 26.0 to 38.0 feet
10-20 MESH COLORADO SILICA SAND
Bentonite Seal(s) 22.5 to 26.0 feet
to feet
Bentonite (type) PELLETS ¼"
Backfill (cuttings) --- to feet
Cement Seal(s) 2.0 to 22.5 feet
0.0 to 2.0 feet
Cement Composition 90% PORTLAND TYPE I-II LOW ALKALI CEMENT 10% BENTONITE, "SAKRETE" CONCRETE MIX TO SURFACE
Protective Casing 2.0 to +1.75 feet
Protective Casing Type 5" NOMINAL DIAMETER STEEL CASING
Other ---

WELL DEVELOPMENT:

Method BAILING - 2½ FT. STAINLESS STEEL BAILER
Duration 1 hrs Estimated production L.T. 1 gpm
Water Appearance MEDIUM BROWN, TURBID
Remarks: TOTAL DISCHARGE = 12.0 GALLONS

WELL/PIEZOMETER COMPLETION DIAGRAM

Project RICHARDSON FLATS TAILINGS SITE

TDD No. T08-9204-15

Location PARK CITY, SUMMIT COUNTY, UTAH

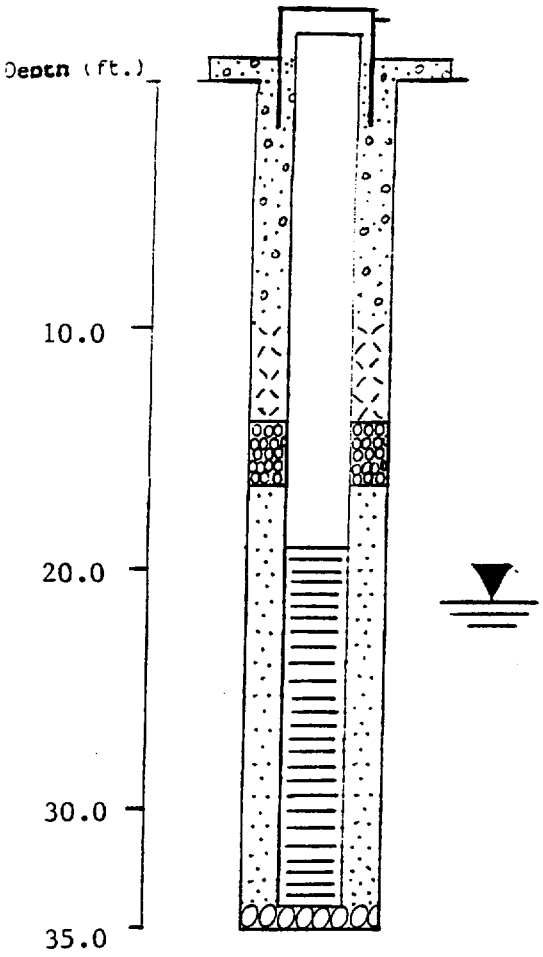
Well Number RF-MW-03

Geologist T. SANDERS

Date(s) of Installation 6/26/92

Depth to water 21.3 feet (G.L.)

Elevation from Measuring Point GROUND SURFACE



DRILLING SUMMARY:

Driller BOYLES BROTHERS DRILLING CO.

Rig Type B-53

Drilling Method AIR ROTARY/CASING DRIVE

Bit(s) HAMMER (ODEX)/ TRI-CONE BITS

Drilling Fluid ---

Surface Casing ---

Hollow Stem/Drive Casing I.D. (in.) 4

Total Depth of Boring (ft.) 35

Borehole Diameter (in.) 4

WELL DESIGN:

Completion Basis: Above Grade X Below Grade

Geological Log X Geophysical Log Type

Total Depth of Well (ft.) 35

Casing String(s): C=casing S=screen

+ 2.5 - 19.0 C -

19.0 - 34.0 S -

Casing: SCHEDULE 80 PVC, 2" I.D. THREADED WITH FLUSH THREADS

Screen: SCHEDULE 80 PVC, 2" I.D., SLOT SIZE 0.010 WITH BOTTOM CAP

Centralizers ---

Gravel/Sand Pack 16.5 to 34.0 feet

10-20 MESH COLORADO SILICA SAND

Bentonite Seal(s) 13.5 to 16.0 feet

to feet

Bentonite (type) PELLETS ½"

Backfill (cuttings) --- to feet

Cement Seal(s) 9.0 to 13.0 feet

Concrete 0.0 to 9.0 feet

Cement Composition 95% PORTLAND TYPE I-II LOW ALKALI 5% BENTONITE, "SAKRETE" CONCRETE MIX TO SURFACE

Protective Casing 2.25 to + 2.75 feet

Protective Casing Type 5" NOMINAL DIAMETER STEEL CASING

Other ---

WELL DEVELOPMENT:

Method BAILING - 2½ FT. STAINLESS STEEL BAILER

Duration 50 MIN. Estimated production L.T. 1 gpm

Water Appearance LIGHT BROWN, TURBID

Remarks: TOTAL DISCHARGE = 10.5 GALLONS

APPENDIX C

BPB INSTRUMENTS, INC.

GEOPHYSICAL WELL LOGGING REPORT
FOR MONITORING WELL INVESTIGATION
RICHARDSON FLATS TAILINGS SITE
PARK CITY, SUMMIT COUNTY, UTAH

SECTION ONE

Background Information

Geophysical logging techniques were used to determine the placement of clay plugs in three monitor wells located at the Richardson Flats Tailings Site, Park City, Utah. Natural Gamma Ray, Gamma-Gamma Density, and Neutron Porosity logs were used to determine anomalies within the wells.

SECTION TWO

Well Characteristics

Three (3) monitoring wells were drilled with depths ranging from 25 feet to 38 feet below ground surface. Wells were drilled to four inch diameter and were completed using two inch PVC. A sand pack and bentonite plug was set between the annulus of the two inch PVC and four inch hole diameter. All geophysical logs were run inside of PVC. Various water depths were present in each monitor well.

As noted on location, monitor wells RF-MW-01 and RF-MW-02 had an inside diameter of 1 7/8 inches. Monitor well RF-MW-03 measured an inside diameter of 2 inches.

SECTION THREE

Site Characteristics

Geologically speaking, the upper zones of each well consist of unconsolidated material, basically local soils, although rubbish associated with a municipal land fill and tailings may make up a majority of the subsurface material.

Residing below the layer of unconsolidated material is a clay zone of such a depth that no one monitor well exceeds the bottom limits of the described zone.

BUS: (303) 241-0302 • FAX: (303) 241-0639
P.O. BOX 2086 • 685 W. GUNNISON AVE., UNIT #1010 • GRAND JUNCTION, CO 81502

SECTION FOUR

Logging Information

All geophysical logs are run from the bottom most depth in the well to the surface. All logs are set at zero at the top of the well, i.e. ground level reads zero feet. Location of bottom most measurement is determined by location of detectors in respect to bottom of tool. Production of a continuous log over the measured section provides accurate readings of both depth and thickness throughout the well.

Repeat sections run in the well provide a record of repeatability of measured responses. Some minor variances may appear due to the statistical nature of data sampled.

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions in our price schedule.

MONITOR WELL RF-MW-01

This monitor well has a total depth of 25 feet and water level was at 8 feet during the time of investigation. Distinct breaks at 5.5 feet in Natural Gamma, Gamma-Gamma Density, and Neutron Porosity responses indicates a homogenous material from the surface to 5.5 feet.

From 5.5 feet to 7.5 feet the Natural Gamma Ray shows a dramatic increase with corresponding responses in the Neutron Porosity and less so in the Gamma-Gamma Density.

Gradational changes in Density and Porosity log responses occur from 7.5 feet to 10.5 feet due to the contact between the water level and air filled portion of the well. The Natural Gamma Ray, unaffected by the water/air interface, shows a homogenous log response from 7.5 feet to total depth indicating that no changes in the formation are present.

Subsurface, unconsolidated material is evident to a depth of 5.5 feet. Contact between unconsolidated material and natural clay formation is at 5.5 feet. Characteristic kicks on all three logs indicate the presence of a bentonite plug from 5.5 to 7.5 feet. A sand pack is indicated from 7.5 feet to total depth of the well.

MONITOR WELL RF-MW-02

This monitor well was drilled to a total depth of 38 feet with water level at 28 feet during the time of investigation.

Log responses indicate a fairly homogenous, unconsolidated material from the surface down to 23 feet although a few exceptions are evident on the Gamma-Gamma Density. A lower density response was measured from 7 feet to 8.5 feet. A denser, more consolidated material was measured from 8.5 feet to 16.5 feet followed by a zone of interbedded material from 16.5 feet to 23 feet.

Log responses from the Density and Porosity logs indicates a distinct contact from 23 feet to 26 feet followed by a zone of denser material from 26 feet to total depth measured.

The zone measured from 26 feet to 36 feet corresponds with the zone from 10.5 feet to 24 feet in monitor well RF-MW-01.

Log responses indicate a zone of homogenous, unconsolidated material from the surface to 23 feet. A bentonite plug is evident from 23 to 26 feet. Contact between unconsolidated material and the clay formation is at 26 feet. Increased Porosity and Density readings from 26 feet to total depth indicates the presence of a sand pack.

MONITOR WELL RF-MW-03

Total drilled depth for this monitor well was 34 feet with a water level of 23 feet at time of investigation.

A subsoil environment is evident in log responses from 0 feet to 9 feet with a zone of interbedded material evident from 6 feet to 9 feet.

A denser zone is evident from 9 feet to 13.5 feet indicating a more compact material.

A less dense material from 13.5 feet to 16 feet is followed by a characteristic break in the Natural Gamma Ray at 16 feet indicating a fairly consistent environment from 16 feet to 33 feet. A zone of less dense material is present from 19 feet to 20.3 feet.

Unconsolidated material was present from the surface to a depth of 9 feet. Contact between unconsolidated material and formation clay is 9 feet. Density and Gamma Ray responses from 13.5 feet to 16 feet would indicate a bentonite plug. A distinct break at 16 feet on the Gamma Ray indicates the contact zone for the sand pack.

APPENDIX D

EPA REGION VIII
SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOC ID # 7163
PAGE # _____

IMAGERY COVER SHEET
UNSCANNABLE ITEM

Contact the Superfund Records Center to view this document.

SITE NAME Richardson Flats

OPERABLE UNIT _____

REPORT OR DOCUMENT TITLE Geophysical Investigation of Mon. Wells

DATE OF DOCUMENT December 9, 1992

DESCRIPTION OF IMAGERY Oversized printout of data logs

NUMBER AND TYPE OF IMAGERY ITEM(S) 1

APPENDIX E

EPA REGION VIII
SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOC ID # 7163
PAGE # _____

IMAGERY COVER SHEET
UNSCANNABLE ITEM

Contact the Superfund Records Center to view this document.

SITE NAME Richardson Flats

OPERABLE UNIT _____

REPORT OR DOCUMENT TITLE Geophysical Investigation of Mon. Wells

DATE OF DOCUMENT December 9, 1992

DESCRIPTION OF IMAGERY Color photographs of sampling techniques

NUMBER AND TYPE OF IMAGERY ITEM(S) 1